HITACHI

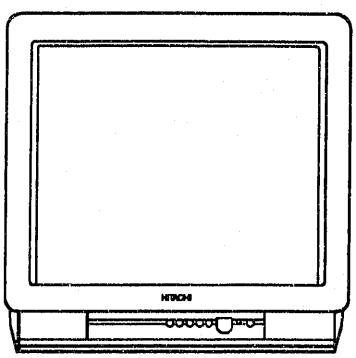
YS | No. 0048E

SERVICE MANUAL

PAL/SECAM/NTSC

CMT2195 – 193
– 194
– 194S
– 982

S3–M3 Chassis



CAUTION: Before servicing this chassis, it is important that the service technician reads the "Safety Precaution" and "Product Safety Notices" in this Service Manual.

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SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT.

COLOR TELEVISION

Aug 1996 Hitachi Consumer Products (S)

SAFETY PRECAUTIONS

WARNING: The following precautions should be observed.

1. Do not install, remove, or handle the picture tube in any manner unless shatter proof goggles are worn. People not so equipped should be kept away while picture tubes are handled. Keep the picture tube away from the body while handing.
2. When service is required, an isolation transformer should be inserted between power line and the receiver before any service is performed on the chassis.
3. When replacing the chassis in the cabinet, ensure all the protective devices are put back in place, such as barriers, non-metallic knobs, adjustment or compartment covers or shields, isolation resistors/capacitors, etc.
4. When service is required, observe the original lead dressing. Extra precaution should be taken to assure correct lead dressing in the high voltage circuitry area. Particularly note the R.G.B. lead dressing. Ensure they are dressed well away from the horizontal scan and F.B.T. circuitry.
5. Always use the manufacturer's replacement component. Always replace original spacers and maintain lead lengths. Especially critical components are indicated thus ⚠ on the parts list and should not be replaced by other makes. Furthermore, where a short circuit has occurred, replace those components that indicate evidence of overheating.
6. Before returning a serviced receiver to the customer, the service technician must thoroughly test the unit to be certain that it is completely safe to operate without danger of electrical shock, and be sure that no protective device built into the instrument by the manufacturer has become defective, or inadvertently damaged during servicing. Therefore, the following checks are recommended for the continued protection of the customers and service technicians.

INSULATION

Insulation resistance should not be less than 7MΩ at 500V DC between the mains poles and any accessible metal parts. Also, no flashover or breakdown should occur during the dielectric strength test, applying 3kV AC or 4.25kV DC for two seconds between the main poles and accessible metal parts.

HIGH VOLTAGE

High voltage should always be kept at the rated value of the chassis and no higher. Operating at higher voltages may cause a failure of the picture tube or high voltage supply, and also, under certain circumstances could produce X-radiation moderately in excess of design levels. The high voltage must not, under any circumstances, exceed 33.4kV on the chassis.

X-RADIATION

TUBES: The primary source of X-radiation in this receiver is the picture tube. The tube utilised for the above mentioned function in this chassis is specially constructed to limit X-radiation.

For continued X-radiation protection, replace tube with the same type as the original HITACHI approved type.

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in HITACHI television receivers have special safety related characteristics. These characteristics are often not evident from visual inspection, nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified by marking with a ⚠ on the schematics and replacement parts list in this Service Manual. The use of a substitute replacement component which does not have the same safety characteristics as the HITACHI recommended replacement one, shown in the parts list in this Service Manual, may create electrical shock, fire, X-radiation, or other hazards.

Product Safety is continuously under review, and new instructions are issued from time to time. For the latest information, always consult the current HITACHI Service Manual. A subscription to, or additional copies of HITACHI Service Manuals, may be obtained at a nominal charge from your HITACHI SALES OFFICES.

TUBE DISCHARGE

The line output stage can develop voltages in excess of 25kV; if the E.H.T. cap is required to be removed, discharge the anode cap to chassis via a high value resistor, prior to its removal from the tube.

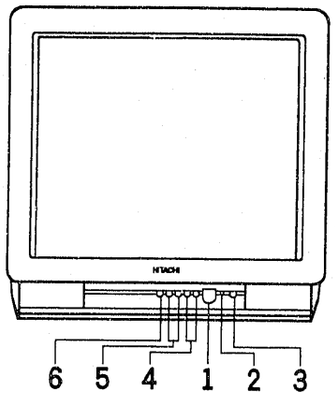
CMT2195

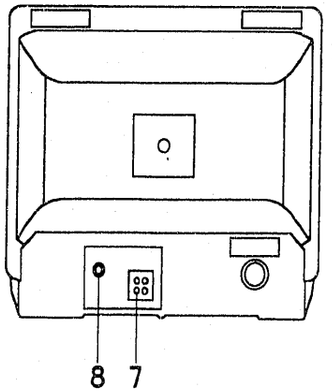
SPECIFICATIONS

Reception system	625-lines B. G/I/D. K/H PAL B. G/D. K/K1 SECAM NTSC50 525-lines M/NTSC NTSC 3.58–5.5/6.0/6.5 NTSC 4.43–5.5/6.0/6.5 PAL 60	Aerial input	75Ω unbalanced type
		Color picture tube	A51JFC61X(H) / A51KPD12XX
		Speaker	9cm × 5cm (×2)
		Sound Output	3W × 2
		Power supply	AC110–230V (50/60Hz)
Channel coverage	CCIR : E2~12, E21~69, S01~3, S1~10, S11~20, S21~41 OIRT : R1~12, R21~69 JAPAN : J1~12, J13~62 U.S.A. : US2~13, J~W, US14~69 HONG KONG, U.K.: UK21~69 CHINA : C1~12, C13~57	Power consumption	85W
		Weight (kg)	21.5
		Dimensions W × H × D (cm)	51.7 × 45.6 × 48.0

※ Specifications are subject to change without notice to improve performance.

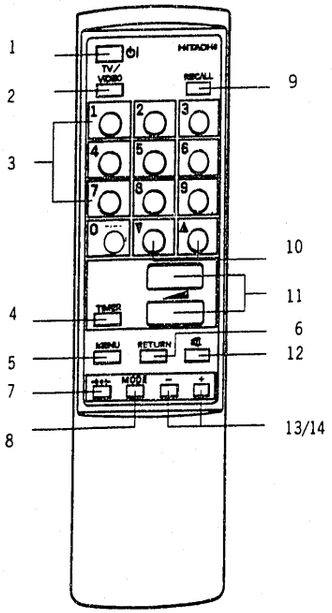
CONTROLS





1 POWER switch
2 Remote control receiver
3 Power indicator
4 Programme up/down
5 Volume up/down
6 TV/VIDEO selection
7 AV in/out terminals
8 Aerial input terminal

REMOTE CONTROL UNIT



1	Power ON/OFF
2	Input select
3	Programme selector
4	Timer
5	Menu
6	Return
7	Normalize
8	Mode
9	Recall
10	Programme up/down
11	Volume up/down
12	Mute
13	Up
14	Down

CIRCUIT DESCRIPTION

Tuner and I. F. Stages:
The tuner used on this chassis, is powered by the +9V, supply, and covers VHF, UHF and CATV Hyper Band. The I. F. output from the tuner is applied to amplifier Q201 then input to CP201 or CP202 as shown in Table 1.

Sound I. F. Stages :
The sound stages consist of IC201, which is basically a demodulator, and IC4501, which is the output amplifier.
The I.F. signal at the collector of Q201, is fed via filter CP201 or CP202 and input to IC201 at pins 45 and 46.
The composite signal output from pin 7 of IC201 is input to sound filters, MF401, MF402, MF403 and MF404, and selected with the mode shown in Table 1 at IC451 after being output from the filter. The selected signal is then input to pin 5 of IC201 via C422.
Demodulation is then performed by the IC, with the sound output being obtained from pin 50. It is then input to pins 2, 5 of IC4501 via C408, for further amplification, and output to the speaker from pins 7, 12.
Volume control is performed by the DC voltage applied to pin 5 of IC201. This is obtained via R427 from pin 8 of IC1101.
Sound demodulation output at pin 1 of IC201, is applied to the terminal of rear via Q401. From the output terminal, the audio signal can be output to external equipment if desired.
Audio signals from external equipment can be applied to the input terminal of rear. They are then input to IC201 at pin 6.
When connecting audio signals this way, a "High" is applied to pins 16 of IC201 from IC1101, thereby changing the internal switching circuitry of the IC.

Table 1

B·G/D·K	M/I	Saw filter	Sound filter	Sound trap
L	H	CP201	MF402 (5.5MHz)	MF501/ MF502
H	L		MF403 (6.0MHz)	
L	L		MF404 (6.5MHz)	
H	H	CP202	MF401 (4.5MHz)	MF503

Vision I. F. Stages :
The I.F. signal from CP201 and CP202 is input to pins 45 and 46 of IC201. These pins supply an internal amplifier consisting of three stages whose gain is controlled by the AGC circuit. The response speed of this internal AGC stage is determined by the external components connected to pin 48.
The output from the I.F. amplifier is then fed to the video detector circuitry. The picture carrier is limited and phase shifted by the tank circuitry of L202 etc., connected between pins 2 and 3 of the IC. This produces a reference frequency which is utilised for synchronous video detection.
An RF AGC voltage is made available at pin 48 of IC201, the starting level of which is determined by the voltage applied to pin 49, which in turn is fixed by the setting of VR202. This AGC voltage is then fed to the tuner via R208 to control its gain accordingly.
The composite video finally emerges at pin 7 of IC201.

Luminance Circuitry :
The composite video signal output from pin 7 of IC201 is applied to the sound rejection filter MF501, MF502, and MF502.

The resulting luminance signal is applied to the terminal of rear, for output to external equipment if desired.
It is then returned to pin 13 of IC201 via Q506, for colour decoding and deflection synchronisation.
The luminance signal is added internally to the R.G.B. matrix circuits of IC201, as well as being controlled by the brightness, contrast, and blanking stages of the IC.
The luminance signal finally emerges with the R.G.B. signals from pins 18, 19 and 20 of IC201.
The voltages to control the contrast and brightness levels are output from pins 3 and 4 of IC1101, then applied to pins 17 and 25 of IC201.
An automatic beam current circuit is employed on this chassis. Should the beam current start to rise, the voltage at pin 4 of the flyback transformer will fall. This fall is applied to the cathode of D758, then via R760 to pin 25 of IC201, thereby reducing the contrast level and hence the beam current.
Video inputs from external equipment connected to the terminal of rear, are fed to IC201 pin 15.
When the external mode is selected, a "High" is applied to pin 16 of IC201.

Chrominance Circuitry :
IC201 is designed to demodulate PAL, NTSC and SECAM systems. And this IC can distinguish between PAL, NTSC or SECAM signals.
The demodulated colour signals are output from IC201 pins 30 and 31 as the R-y and B-y signals, then fed to pins 14 and 16 of IC501 which is a switch capacitor delay line.
IC201 allows bi-directional communication between the SECAM decoder IC502 and automatic system manager for SECAM identification. It delivers the VCXO (voltage controlled xtal osillator) reference freguency (4.43MHz only) to the SECAM decoder via pin 32 of IC201. Once SECAM is identified, the gated reference signal is outputted to pin 32 of IC201.
The inputs at pins 14 and 16 are clamped, then fed via a buffer stage to internal delay lines, which are driven by a clock signal of 3MHz to obtain a delay period of 640 Seconds.
This internal clock is generated from a 6MHz voltage controlled oscillator, and line locked by the sandcastle pulse input at pin 5. Low pass filters after the delay line stages suppress the clock signals.
The undelayed and the delayed signals are then added, with the resulting R-y and B-y signals being output from pins 11 and 12 via an internal buffer stage.
These outputs are then fed to IC201 at pins 28 and 29.
This IC contains clamping circuits, and a DC colour saturation control, the level of which is set by the voltage applied to pin 26 from pin 5 of IC1101. The signals are then applied to a MATRIX circuit, and finally emerge from pins 18, 19 and 20 as the blue, green, and red signals.

Deflection Circuits :
The deflection circuitry of IC201 contains a sync, separator stage, horizontal oscillator and output stages, a vertical count-down and output stage.

Horizontal Stage :

The composite video signal from pin 7 of IC201 is returned to pin 13 via C302 as explained previously. This input is applied to the internal sync. separator stages of the IC.

A internal phase detector stage is provided with a sawtooth waveform, generated from the line pulse input to pin 38. The phase detector will then compare this sawtooth waveform to the sync. pulse. Any frequency drift will cause a corrective output to be applied to the horizontal oscillator, thereby maintaining the desired phase relationship.

The components connected to pin 40 form a filter network for the phase detector, and VR701/connected to pin 39 provides manual phase control. The horizontal output emerges at pin 37 and is then applied to the base of line drive transistor Q721, T721 couples the output of Q721 to the line output transistor Q781. Both these transistors are powered by the 95V supply.

A line pulse available at pin 6 of the flyback trasformer is rectified by D751, smoothed by C756 and provides approximately 170V to drive the output transistors Q851, Q852, Q853.

Under certain fault conditions, i.e. increased H.T. supply, low line oscillator frequency, or reduced value of the tuning capacitor C781, an excess of E.H.T. could be developed. To prevent this happening, the rectified voltage of D751 is fed via potential divider R757, R758, and applied to ZD751. Should the E.H.T. rise excessively, the threshold of the zener will be exceeded, and a voltage will be applied to pin 35 of IC1101 via R1106, thereby shutting down the power circuit.

This effectively applies a "Low" to Q954 base, turning the transistor off. Consequently, Q953 will be turned off, and the +8V supply to IC201 is then removed, thereby shutting down the deflection stages of the IC, preventing further E. H. T. generation.

Excessive beam current can also occur under certain fault conditions, so this is prevented in the following manner.

The H.T. current to the horizontal output stages is measured by R781.

Should the current rise, the voltage drop across R781 will increase, and a voltage will be applied to the gate of Q955. This will then prevent further E.H.T. generation as described earlier.

A supply of +25V is required for IC681. This is obtained from pin 1 of the flyback transformer, and smoothed by C754.

Vertical Stages :

The internal vertical sync. of IC201 is fed to a triggered vertical divider stage, which counts down the horizontal frequency to obtain the vertical frequency, thereby eliminating the need for a conventional oscillator circuit.

This also has the advantage that no external frequency control is required.

C601 at pin 42 of the IC is used for ramp generation, and produces the required sawtooth output.

The vertical output from pin 43 of IC201 is applied to pin 4 of IC681 via R604. The components D601 and C605 determine the flyback generation time, and the vertical output to drive the deflection coils is made available from pin 2.

The deflection current that occurs at the junction of R609, is added to the feedback from R607/C608 etc. and the result is applied to pin 41 of IC201. The values of R607 and C608 determine the linearity, whilst VR601 sets the vertical height.

Power Supply Circuit:

(1) Starting operation
- Power switch S901 turned ON → Rectified at D901~D904 → Voltage at Q903 base rises → First Switching pluse generated at winding (P1-P2) of T901 → Drive voltage → Provide to Q905 of winding (B1-B2) of T901→ Q905 supply stable drive current to Q903 base → come into normal operation.

(2) Switching constant voltage operation
- AC input voltage rises or +B load decreased (picture gets dark) → +B (95V) rises → Ic increased at Q951 → Id increased at IC901 → Ic increased at IC901 → Voltage decreased at pin ⑤of IC901 → ON period of Q901 increased → ON period of Q903 decreased → Positive voltage of D951 anode decreased → +B voltage falls → +B voltage stabilized.

(3) Standby operation
- Remote control power OFF → IC1101 ㉑ and ㉒ ㄴ → Q954 OFF → Q953 OFF → IC201 H. Start Pin ㊱ stopped → Horizontal deflection stopped.
- Also → Q952 OFF → R965 connect into R964 → Voltage of Q951 base rises → ON period of Q903 is slightly decreased by IC901 → +B voltage falls (about 62V) → Power consumption decreased.

  +5V power provided from T901 (S3-S4) winding through D952 and C954 → 5V at pin ㉗ of IC1101 stabilized by ZD1101.

Remote Control and Tuning Circuitry :

The remote control receiving unit CP1201, contains an infrared amplifier and powered by the +5V supply, which is stabilized by ZD1101. The output from pin 2 of this unit is applied to pin 16 of IC1101.

This IC type M37210M4, performs channel selection. UP/DOWN analogue control, an screen display, search tuning, and controls inputs and search tuning, and controls inputs and outputs to and from the AV terminal.

IC1102 is the memory IC, which stores the data relating to the above functions, then transfers that information to IC1101 when required. Both these ICs are powered by the +5V supply.

X1101 supplies IC1101 with a basic clock frequency which controls all operating mode requirements.

When the TV is first switched on, IC1101 must be initially reset, and this is achieved by IC1101 stage. As the +5V supply begins to rise from switch on, pin 3 of Q1105 is held "Low". This is applied to pin 30 of IC1101 thus resetting the IC. Once pin 1 of Q1105 has almost reached its +5V potential, the "Low" is removed from pin 3 thus releasing the reset condition.

When the search routine has been initiated and a signal has been located, pin 14 of IC201 will become "High". This is applied to pin 34 of IC1101, and informs the IC that a signal is present. The search routine then stops, and the IC will monitor the AFC signal present at pin 15 to obtain the optimum signal.

Pins 46 and 47 control the signal system.

Contrast, colour, brightness, sharpness, tint, and volume are all controlled from the remote control handset (the volume can also be adjusted by + and − buttons on the front of the TV), and will produce DC level changes from pins 3~8 of IC1101, which are then fed to the relevant pins of IC201.

Pins 31~32, 37~39, and 11 from the in and out matrix are for the front control operations.

Pins 12 and 13 are the clock and data output pins. These signals are supplied to the memory IC1102.

It is supplied to pin 16 of IC201. When "High", the IC will process external inputs applied to pins 13 and 15, and when "Low", the internal signals are processed.

The handset button marked TV/VIDEO will need to be pressed. This will thsn produce the required "High" from pin 20 to achieve the necessary switching, as explained earlier.

The red, green and blue on-screen display signals are output from pins 50, 51 and 52. The components L1102, C1102, and C1103, on pins 28 and 29, determine the display oscillator frequency. The horizontal and vertical inputs at pins 1 and 2 determine the actual position of the on screen display.

When a command requiring an on-screen display is received by IC1101, a "High" will be output from pin 49.

This is applied to pin 21 of IC201, and blanks out a portion of the picture. The on-screen display information is then inserted into this portion, thus resulting in a clear display.

When the ALARM mode has been set, and the time input has elapsed, an output is obtained from pin 45 of IC1101.

This is then applied via R1184, R1119, C1111, R1178 etc. to pins 2 and 5 of IC4501 thus causing a "Bleep" sound to be heard.

Once the "OFF" timer mode has been set, and the time input has elapsed, pins 21 and 22 of IC1101 output a "Low".

This removes the supply to the base of Q903, and as a result the +9V output of Q902 disappears. This places the TV into its standby mode of operation by removing E.H.T. generation as explained previously.

When the "ON" time has been estimated and set, the standby command must be transmitted by the handset, to place the TV into its standby mode. As an indication that the standby mode is only temporary, pin 20 of IC1101 is taken "High" and "Low" alternately, causing D1114 to flash on and off.

When the entered time has elapsed, the "Low" outputs from pins 21 and 22 of IC1101 are removed, and the TV will return to normal operation.

PIN DESCRIPTION FOR IC201 - TDA 8362

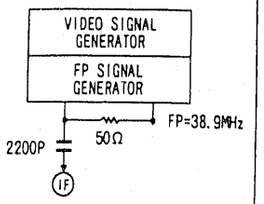
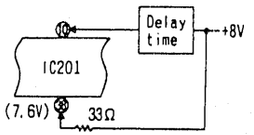
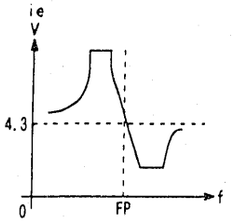
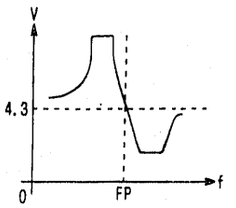
PIN NO.	DESCRIPTION	
1	Audio deemphasis and +/- mod. switch	Audio output of non-volume controlled and have to be buffered.
2	IF-demodulator tuned circuit	Adjust AFC output voltage of 4.3V measure at pin 44.
3	IF-demodulator tuned circuit	
4	Video identification output - N.C.	
5	Sound IF in plus volume control	
6	External audio input -	
7	Video output	
8	Decoupling digital supply	
9	Ground	
10	Positive supply (8V)	
11	Ground	
12	Decoupling filter tuning	
13	Internal CVBS input	Derived from internal RF video output (Pin 7) and supplied to the synchronization, luminance and chrominance processing (level ≈ 2Vpk-pk) by selection.
14	Peaking control input	
15	External CVBS input	Derived from external video source and supplied to the synchronization, laminance and chrominance processing (level ≈ 1Vpk-pk) by selection.
16	Chroma + A/V switch input	DC voltage control the selection of internal/external CVBS (Pin 13 or 15) and audio. i.e. <0.5V : Internal signals >7.5V : External signals
17	Brightness control input	
18	B-output	
19	G-output	
20	R-output	
21	RGB-insertion and blanking input	
22	R-input for insertion	
23	G-input for insertion	
24	B-input for insertion	
25	Contrast control input	
26	Saturation control input	
27	Hue control input	Color decoder selection between NTSC or PAL/SECAM. i.e. 0~5V : NTSC decoder activated >6V : PAL/SECAM decoder applied
28	B-Y input signal	
29	R-Y input signal	
30	R-Y output signal	
31	B-Y output signal	
32	SECAM Reference/Communication	
33	Loop filter burst phase detector	
34	3.58 MHz X-tal connection	
35	4.43 MHz X-tal connection	
36	Start horizontal oscillator	Start supply pin. If the start voltage is below 5.8V, the horizontal output will be disabled. (Normal — 7.2V~8.8V)
37	Horizontal output	
38	Flyback input/sandcastle output	
39	Φ-2 loop filter	
40	Φ-1 loop filter	
41	Vertical feedback input	
42	Vertical ramp generator	Generates a linear sawtooth output for the vertical output stage.
43	Vertical drive output	This pin is the current output of the vertical pre-amplifier and drives the vertical deflection stage. The amplifier has a feedback output, Pin 41, in order to sense the current in the vertical D.Y.
44	AFC output	
45	IF-input	IF input from Tuner and Saw Filter.
46	IF-input	
47	Tuner AGC output	Voltage to change the Tuner gian when RF input signal amplitude becomes too strong.
48	AGC decoupling capacitor	The Tuner AGC control takes over when IF input reaches a certain input level, the take over point is adjusted at this point.
49	Tuner take-over adjustment	
50	Audio output	
51	Decoupling sound demodulator	
52	Decoupling bandgap supply	

PIN DESCRIPTION FOR IC1101 - M37210M4-655SP/657SP

PIN NO.	DESCRIPTION		
1	HSYNC	Input	This is the horizontal synchronous signal input pin for On-screen display
2	VSYNC	Input	This is the vertical synchronous signal input pin for On-screen display
3	BRIGHT	Output	Output of the different DC levels to control each function e.g. COLOR UP/DOWN, VOLUME UP/DOWN etc ...
4	CONT.	Output	
5	COLOR	Output	
6	SHARP	Output	
7	TINT	Output	
8	VOL.	Output	
9	BASS	Output	No connection
10	TREB.	Output	
11	$P4_2$	Input	Return of front control matrix
12	$P4_1$	Output	Memory IC clock signal output
13	$P4_0$	In/Out	Memory IC data IN/OUT
14	TUNING VOLTAGE	Output	Tuning control voltage to tuner
15	AFC	Input	AFS voltage input. After A/D conversion, this pin also serve to detect the present of RF signal
16	R/C	Input	Remote con. serial data input from R/C receiving unit CP1201
17		—	
18	50/60 Hz IDENT	Input	To identify the frequency of RF signla. (50 Hz or 60 Hz)
19	N.C.	—	
20	TV/VIDEO	In/Out	Sellection of "TV" or "Video In" signal. H:TV L:Video In
21	BAND 1	Output	Standby: BAND 1 L, BAND 2 L; ON: BAND 1 •, BAND 2 H; VHF L: BAND 1 L, BAND 2 H; VHF H: BAND 1 H, BAND 2 H; UHF: BAND 1 H, BAND 2 L
22	BAND 2	Output	
23	CNVss	—	GND 0V
24	XIN	Input	4 MHz Clock In
25	XOUT	Output	4 MHz Clock Out
26	Vss	—	GND 0V
27	Vcc	—	+5V Power supply ±10% Tolerance.
28	OSC 2	Input	Display oscillator frequency output
29	OCS 1	Output	Display oscillator frequency input
30	RESET	Input	Resets IC1011 initiated by Band 1 and Band 2 (Pins 21, 22) Resets when power is "ON"
31		Input	Return of Front control matrix
32		Input	
33	COLOR IDENT	Input	Color identification of SECAM, NTSC or PAL
34	HSYNC IDENT	Input	A/D terminal served to detect the present of Hsync signal
35	PROTECT	Input	Shuts down power circuit
36	EEP-CS	In/out	EEPROM chip select
37	SCAN 3	Output	Output for front panel control matrix to control vol., programme ...
38	SCAN 2	Output	
39	SCAN 1	Output	
40	SKEW	Output	"High" when 4.5MHz sound detected
41	HITACHI DISPLAY	Input	High: "HITACHI" display appears when no signal received
42	50/60 Hz Control O/P	Output	Ident by pin 18 and controls output from this pin. 50 Hz = L, 60 Hz = H
43	SDA	In/Out	No connection
44	SCL	Output	No connection
45	ALARM	In/Out	Alarm output L = OFF Alarm = ⎍⎍⎍ 50% Duty cycle
46	I/M	In/Out	Selects the sound system: I/M 4.5 MHz H, 5.5 MHz H, 6.0 MHz L, 6.5 MHz L; BG/D, K 4.5 MHz H, 5.5 MHz L, 6.0 MHz H, 6.5 MHz L
47	B, G/D, K	Output	
48	IDENT	In/Out	
49	BLK	Output	On-Screen-Display blanking output
50	B	Output	Blue output for On-Screen-Display
51	G	Output	Green output for On-Screen-Display
52	R	Output	Red output for On-Screen-Display

P. I. F. CARRIER FILTER ADJUSTMENT

ADJUSTMENT LOCATION L202

Preparations for adjustment	Adjustment Procedure	Remarks/Waveform
(1) Apply the following signal across IF out and GND of tuner.  SIGNAL LEVEL : −10~0dBm SIGNAL : PHILIPS PATERN (2) Connect the oscilloscope to the pin ⑭ of IC201. (3) Supply DC voltage as below.  Delay time : More than 0.1sec.	(1) Adjust L202 until a "Fast rate of charge" is seen on voltmeter. Then adjust L202 to obtain reading on voltmeter as below. 4.3±0.2V 	

+B ADJUSMENT

ADJUSTMENT LOCATION R963 (VR 951)

Preparation for adjustment	Adjustment Procedure	Remarks/Waveform
(1) AC input voltage 220 ± 5V/50HZ. (2) Turns on the set and set the brightness and contrast to max. (SIGNAL: PHILIPS PATTERN) (3) After 30 sec heat-run, check & adjust the +B voltage. Measuring Point: +B voltage : C956 + side GND : C956 − side	(1) Adjust R963 (VR 951) to obtain +B voltage as below. +B voltage = 95 ± 0.3V	

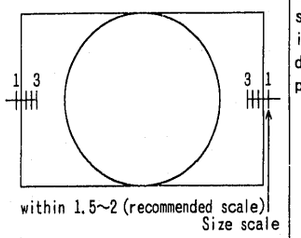
AGC ADJUSTMENT

ADJUSTMENT LOCATION VR202

Preparations for adjustment	Adjustment Procedure	Remarks
1 With the signal received, apply heat run for more than two minutes to avoid the influence of circuit tempereture drift. 2 Connect the voltmeter of at least 100kΩ internal impedance to the AGC terminal of the tuner.	1 Received following channel and strength. CHANNEL : CCIR 5 STRENGTH : −49dBm Adjust VR202 until the following voltage is reached. V1−(0.5v±0.2v) 2 V1:the voltage without signal	

HORIZONTAL CENTER POSITION ADJUSTMENT

ADJUSTMENT LOCATION VR701

Preparations for adjustment	Adjustment Procedure	Remarks
1 Receive the circle pattern signal. 2 Set the brightness and contrast VRs to maximum.	1 Turn VR701 (H. Phase) and adjust so that size scales on the left and right are equal. (Refer to Fig. 3-2-1.)  Fig. 3-2-1	Picture information amount The amount of information means the amount of the transmitted picture that can be displayed on the CPT screen. It is necessary to increase this amount of information as much is possible and also decrease the lack of raster as far as possible.

VERTICAL AMPLITUDE ADJUSTMENT

ADJUSTMENT LOCATION VR601

Preparations for adjustment	Adjustment Procedure	Remarks
1 Start adjustment 5 minutes or more after the power switch is tunred on. 2 Receive the PAL circle pattern signal. 3 Set the brightness and contrast VRs to maximum. 4 Place the set facing north or south.	1 Select V. CENT select chip E601 "u", "N" and "D" so that the center of the picture is closest to the geometrical center of the CPF. 2 Adjust VR601 as shown in Fig. 3-3-1. 3 Receive the NTSC circle pattern signal and check that the picture is the same as that when a PAL signal is received.	

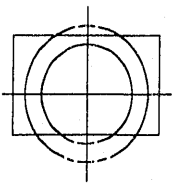
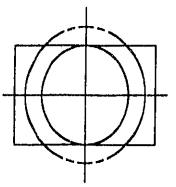
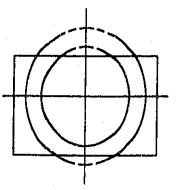
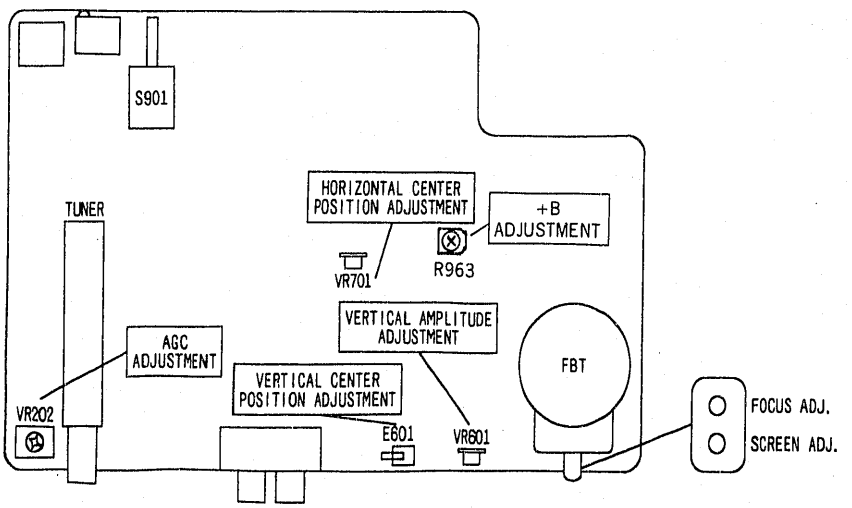
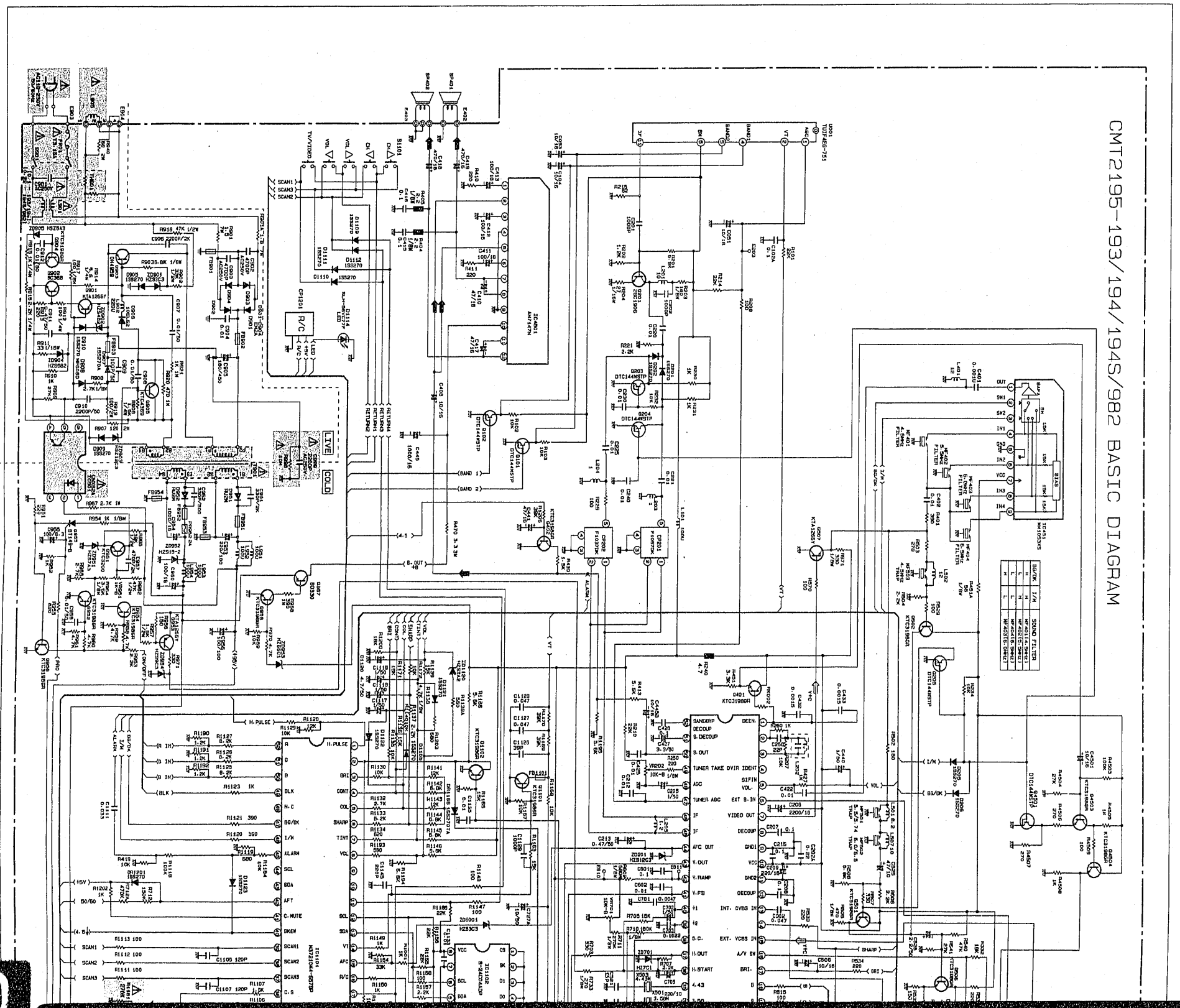
		Top shrinked, bottom expanded	Standard condition	Top expanded, bottom shrinked
Picture condition				
Adjustment method	Picture top	Center of inner and outer circles	Center of inner circle	
	Picture bottom		Inner circle	Center of inner and outer circles

Fig. 3-3-1

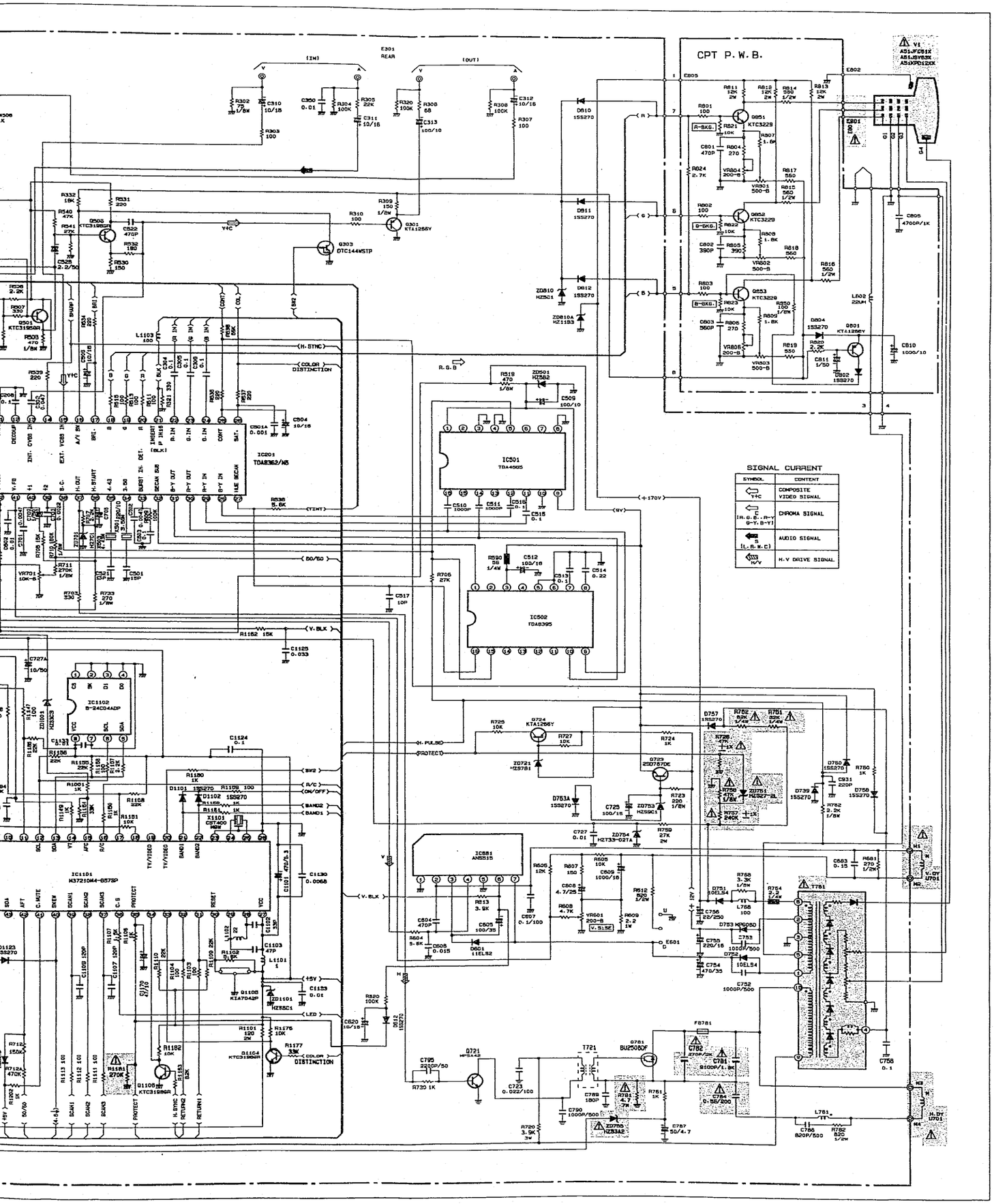
ADJUSTMENT POINT



CMT2195-193/194/194S/982 BASIC DIAGRAM



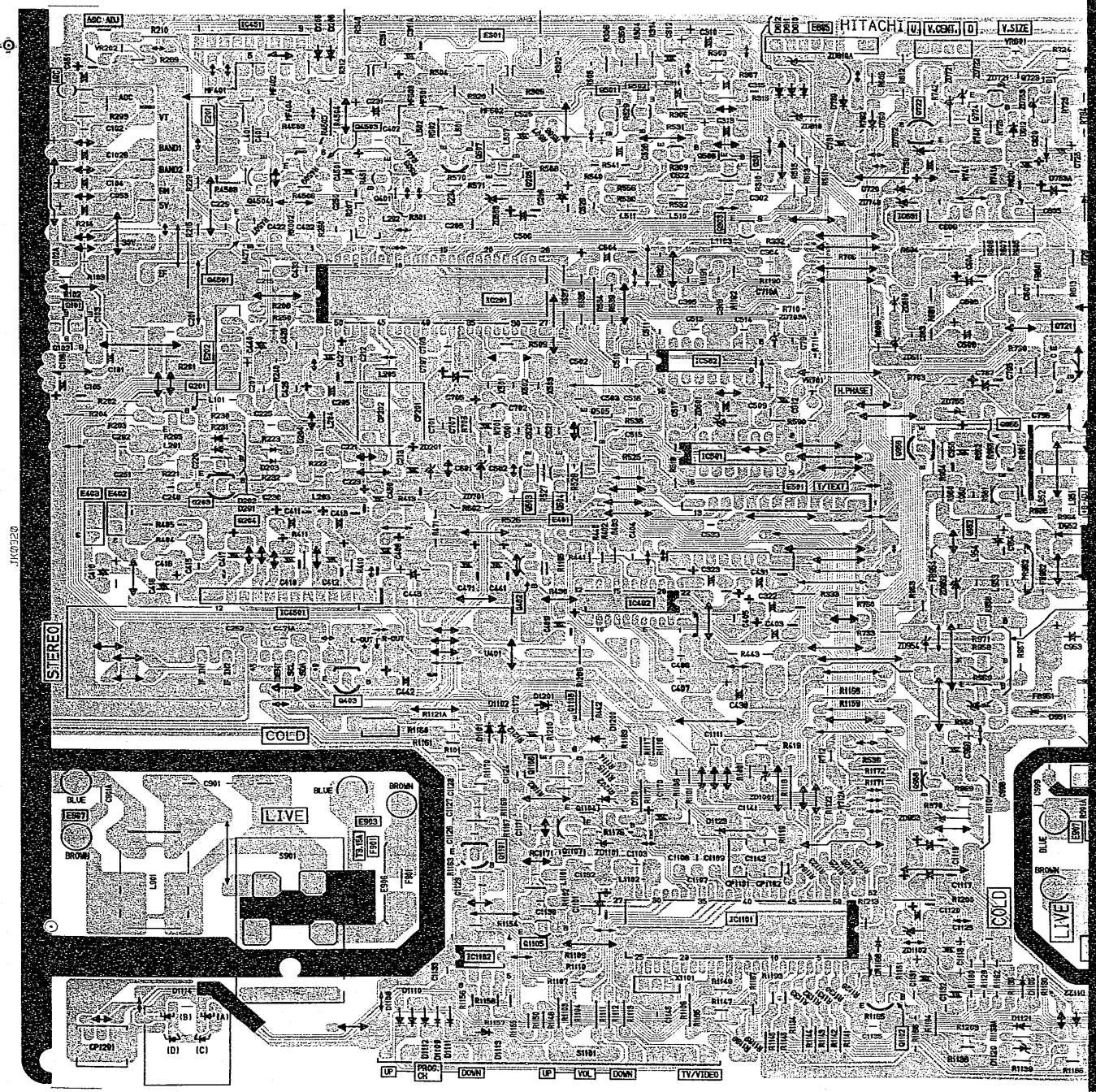
PRODUCT SAFETY NOTE : Components marked with a ⚠ and shaded have special characteristics important to safety. Before replacing any of these components, read carefully the PRODUCT SAFETY NOTICE of this Service Manual. Don't degrade the safety of the receiver through improper servicihg.



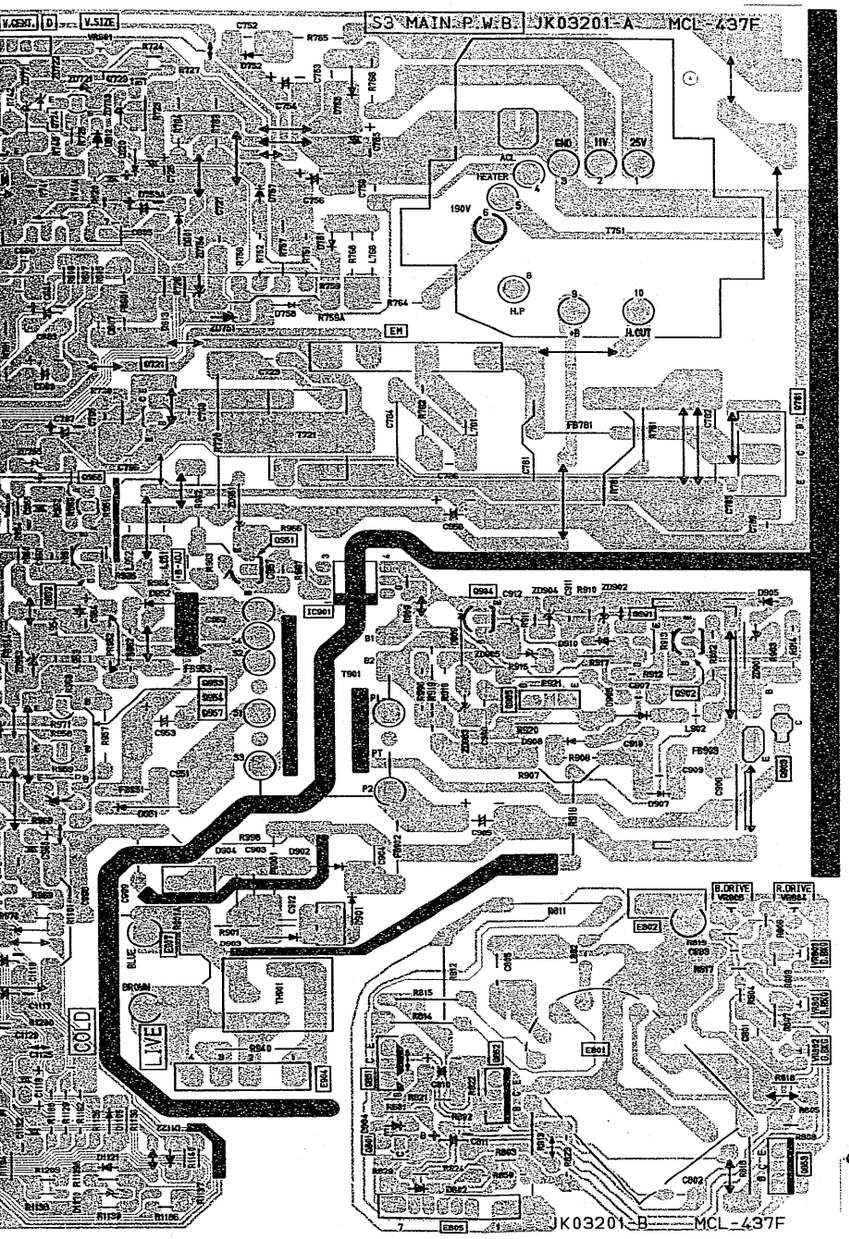
- 13 -

- Since this is a basic circuit diagram, the value of the parts is subject to be altered for improvement.
- All DC voltage to be measured with a teser (100kΩ/V).
  Voltage taken on a complex color bar signal including a standard color bar signal.

MAIN P.W.B.

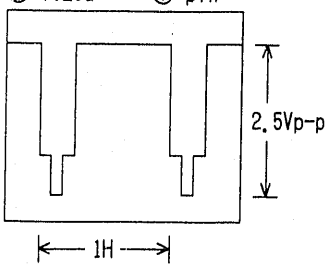

HITACHI
V.CENT.
V.SIZE
H.PHASE
STEREO
COLD
LIVE
BLUE
BROWN
PROG. CH
UP
DOWN
VOL.
TV/VIDEO

V.B.

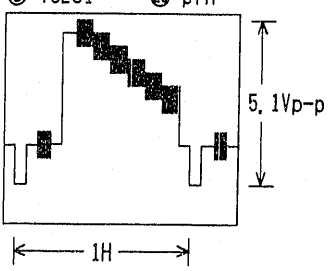

S3 MAIN P.W.B. JK03201-A MCL-437F
GND
11V
25V
HEATER
190V
H.P
+B
H.OUT
V.SIZE
LIVE
COLD
BLUE
BROWN
B.DRIVE
R.DRIVE
JK03201-B MCL-437F

WAVEFORMS

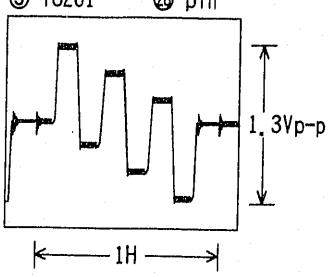
① IC201 ⑦ pin



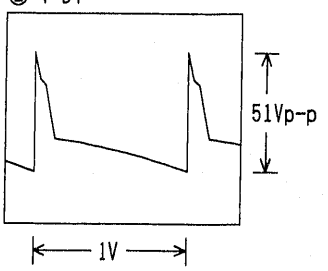
⑤ IC201 ⑳ pin



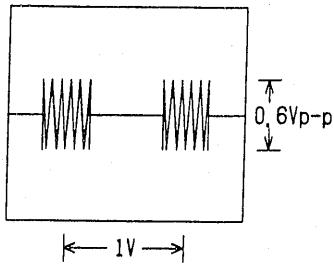
⑨ IC201 ㉘ pin



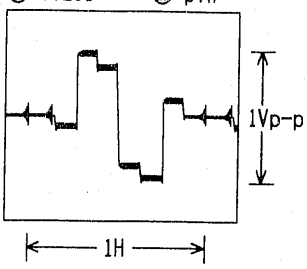
② V-DY



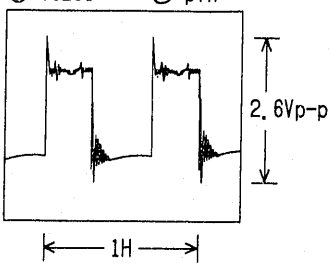
⑥ IC201 ㉜ pin SECAM



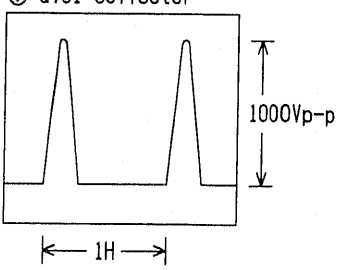
⑩ IC201 ㉙ pin



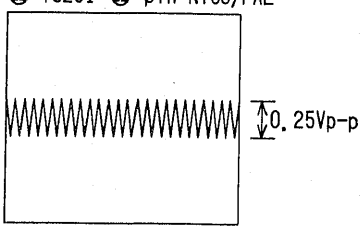
③ IC201 ㊲ pin



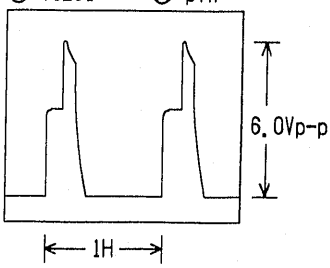
⑦ Q781 Collector



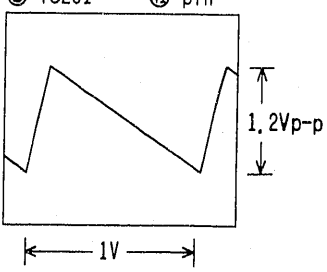
⑪ IC201 ㉜ pin NTSC/PAL



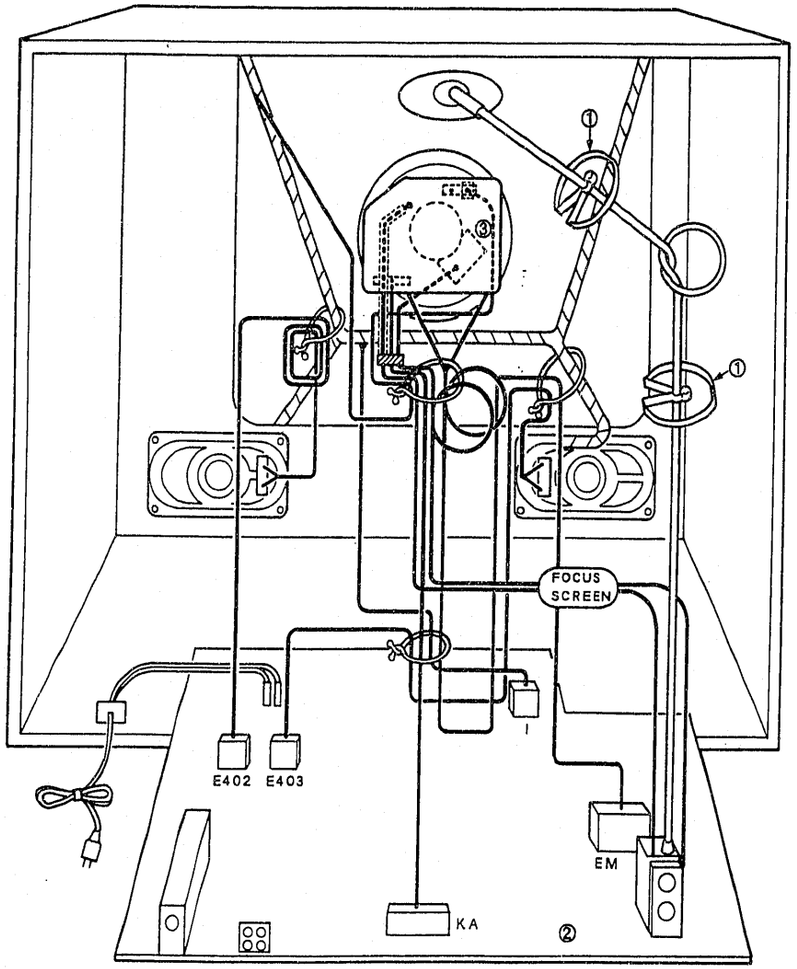
④ IC201 ㊳ pin



⑧ IC201 ㊶ pin



WIRING DIAGRAM



①	Adjust the position so that the anode lead does not touch the DY
②	Main P. W. B.
③	CPT P. W. B.

CMT2195

REPLACEMENT PARTS LIST

PRODUCT SAFETY NOTE: Components marked with a ⚠ have special characteristics important to safety Before replacing any of these components, read carefully the PRODUCT SAFETY NOTICE of this Service Manual. Don't degrade the safety of the receiver through improper servicing.

ABBREVIATIONS
Capacitors.....CD: Ceramic Disk, PF: Polyester Film, EL: Electrolytic, PP: Polypropylene, PR: Paper, TA: Tantalum, TM: Trimer.
Resistors.....CF: Carbon film, WW: Wire Wound, FR: Fuse Resistor, MG: Metal Glazed, VR: Variable Resistor, CC: Carbon Composition, MF: Metal Oxide Film.
Semiconductors.....TR: Transistor, DI: Diode, ZD: Zener Diode, VA: Varistor, TH: Thermistor.

SYMBOL NO.	PART NO.	DESCRIPTION	SYMBOL NO.	PART NO.	DESCRIPTION
C051	0800015R	EL 10MF 16V	C231	0800048R	EL 100MF 10V
C053	0800015R	EL 10MF 16V	C240	0880009R	PF 0.01MF +-10% 50V
C101	0800048R	EL 100MF 10V	C250	0890118R	CD 22PF +-5% 50V
C102	0880016R	PF 0.1MF +-10% 50V	C251	0880003R	PF 1000PF +-10% 50V
C102A	0880016R	PF 0.1MF +-10% 50V	C302	0880014R	PF 0.047MF +-10% 50V
C103	0880009R	PF 0.01MF +-10% 50V	C304	0880016R	PF 0.1MF +-10% 50V
C104	0800015R	EL 10MF 16V	C305	0880016R	PF 0.1MF +-10% 50V
C1101	0800072R	EL 470MF 6.3V	C306	0880016R	PF 0.1MF +-10% 50V
C1102	0890067R	CD 33PF +-5% 50V	C310	0800015R	EL 10MF 16V
C1103	0890069R	CD 47PF +-5% 50V	C311	0800015R	EL 10MF 16V
C1107	0890075R	CD 120PF +-5% 50V	C311A	0800015R	EL 10MF 16V
C1108	0890075R	CD 120PF +-5% 50V	C312	0800015R	EL 10MF 16V
C1109	0890075R	CD 120PF +-5% 50V	C313	0800048R	EL 100MF 10V
C1111	0880013R	PF 0.033MF +-10% 50V	C350	0880009R	PF 0.01MF +-10% 50V
C1117	0800003R	EL 1MF 50V	C351	0880005R	PF 0.0022MF 50V
C1118	0800003R	EL 1MF 50V	C401	0880003R	PF 1000PF +-10% 50V
C1119	0800003R	EL 1MF 50V	C402	0880009R	PF 0.01MF +-10% 50V
C1120	0800012R	EL 4.7MF 50V	C408	0800015R	EL 10MF 16V
C1124	0880016R	PF 0.1MF +-10% 50V	C410	0800041R	EL 47MF 16V
C1125	0880013R	PF 0.033MF +-10% 50V	C411	0800049R	EL 100MF 16V
C1126	0890122R	CD 39PF +-5% 50V	C412	0800049R	EL 100MF 16V
C1127	0880014R	PF 0.047MF +-10% 50V	C413	0800049R	EL 100MF 16V
C1128	0880014R	PF 0.047MF +-10% 50V	C415	0880016R	PF 0.1MF +-10% 50V
C1129	0880003R	PF 1000PF +-10% 50V	C416	0880016R	PF 0.1MF +-10% 50V
C1130	0880008R	PF 6800PF +-10% 50V	C417	0800041R	EL 47MF 16V
C1133	0880009R	PF 0.01MF +-10% 50V	C418	0800074N	EL 470MF 16V
C1135	0880009R	PF 0.01MF +-10% 50V	C419	0800074N	EL 470MF 16V
C1145	0890078R	CD 220PF +-5% 50V	C422	0880009R	PF 0.01MF +-10% 50V
C1170	0800039R	EL 47MF 10V	C425	0880009R	PF 0.01MF +-10% 50V
C201	0890087R	CD 1000PF +-10% 50V	C427	0800007R	EL 3.3MF 50V
C202	0890087R	CD 1000PF +-10% 50V	C428	0880016R	PF 0.1MF +-10% 50V
C205	0800003R	EL 1MF 50V	C432	0880004R	PF 1500PF +-10% 50V
C206	0800087F	EL 2200MF 16V	C433	0880004R	PF 1500PF +-10% 50V
C207	0880016R	PF 0.1MF +-10% 50V	C440	0284623R	EL 1MF 50V (BP)
C208	0880016R	PF 0.1MF +-10% 50V	C441	0800041R	EL 47MF 16V
C212	0880009R	PF 0.01MF +-10% 50V	C445	0800082F	EL 1000MF 16V
C213	0800001R	EL 0.47MF 50V	C4501	0800015R	EL 10MF 16V
C215	0880016R	PF 0.1MF +-10% 50V	C458	0800015R	EL 10MF 16V
C220	0880009R	PF 0.01MF +-10% 50V	C501	0890116R	CD SL 15PF +-5% 50V
C221	0880009R	PF 0.01MF +-10% 50V	C502	0880007R	PF 4700PF +-10% 50V
C225	0880009R	PF 0.01MF +-10% 50V	C503	0880016R	PF 0.1MF +-10% 50V
C230	0880009R	PF 0.01MF +-10% 50V	C504	0800015R	EL 10MF 16V

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SYMBOL NO.	PART NO.	DESCRIPTION	SYMBOL NO.	PART NO.	DESCRIPTION
C506	0800015R	EL 10MF 16V	C811	0800003R	EL 1MF 50V
C509	0800048R	EL 100MF 10V	⚠ C901	0279697F	PF 0.1MF 250V (193/194)
C510	0890087R	CD 1000PF +-10% 50V	⚠ C901	0262774	PF 0.22MF 250V (194S/982)
C511	0890087R	CD 1000PF +-10% 50V	C902	0248593F	CD 4700PF +80-20% 250V
C512	0800049R	EL 100MF 16V	C903	0248593F	CD 4700PF +80-20% 250V
C513	0880016R	PF 0.1MF +-10% 50V	C904	0248594F	CD 0.01MF +80-20% 250V
C514	0880018R	PF 0.22MF +-10% 50V	C905	AL00097	EL 180MF 450V
C515	0880016R	PF 0.1MF +-10% 50V	C906	0244215	CD 2200MF 2KV
C516	0880016R	PF 0.1MF +-10% 50V	C907	0880009R	PF 0.01MF +-10% 50V
C517	0890061R	CD 10PF +-5% 50V	C908	0880009R	PF 0.01MF +-10% 50V
C521	0248663R	CD SL 13PF +-5% 50V	C909	0890075R	CD 120PF +-5% 50V
C522	0890083R	CD 470PF +-10% 50V	C910	0880005R	PF 2200MF +-10% 50V
C525	0284666R	EL 47MF 10V (BP)	C911	0880203R	PF 0.47MF 50V
C528	0800005R	EL 2.2MF 50V	C912	0880009R	PF 0.01MF +-10% 50V
C533	0880016R	PF 0.1MF +-10% 50V	C951	0244718	CD 330MF 2KV
C601	0880016R	PF 0.1MF +-10% 50V	C952	0243507	CD 330PF +-10% 500V
C602	0880044R	PF 0.01MF +-10% 50V	C953	0258129F	EL 220MF 100V
C604	0890083R	CD 470PF +-5% 50V	C954	0800082F	EL 1000MF 16V
C605	0800052R	EL 100MF 35V	C955	0800047R	EL 100MF 6.3V
C606	0880011R	PF 0.015MF +-10% 50V	C956	0800055N	EL 100MF 100V
C607	0279693R	PF 0.1MF +-10% 100V	C957	0243509R	CD 470PF +-10% 500V
C608	0800009R	EL 4.7MF 25V	C958	0880009R	PF 0.01MF +-10% 50V
C609	0800082F	EL 1000MF 16V	C960	0800049R	EL 100MF 16V
C620	0800015R	EL 10MF 16V	⚠ C999	AJ00184F	CD 2200PF +80-20% 250V
C683	0880017R	PF 0.15MF +-10% 50V	CP1201	2574762A	REMOTE CONTROL RECEIVER
C701	0880007R	PF 4700PF +-10% 50V	CP201	2306121	SAW FILTER F1057DK
C702	0800003R	EL 1MF 50V	CP202	2306122	SAW FILTER F1037DK
C703	0880005R	PF 2200PF +-10% 50V	D1101	2338321M	DI 1SS270
C705	0800058R	EL 220MF 16V	D1102	2338321M	DI 1SS270
C723	0279851F	PF 0.022MF +-10% 100V	D1105	2338321M	DI 1SS270
C725	0800049R	EL 100MF 16V	D1109	2338321M	DI 1SS270
C727	0880009R	PF 0.01MF +-10% 50V	D1110	2338321M	DI 1SS270
C731	0890078R	CD 220PF +-5% 50V	D1111	2338321M	DI 1SS270
C752	0244501R	CD 1000PF +-10% 500V	D1112	2338321M	DI 1SS270
C753	0244501R	CD 1000PF +-10% 500V	D1114	CH00231K	LED SLH-56VC3F
C754	0800076F	EL 470MF 35V	D1121	2338321M	DI 1SS270
C755	0800058R	EL 220MF 16V	D1122	2338321M	DI 1SS270
C756	0253973F	EL 22MF 250V	D1123	2338321M	DI 1SS270
C758	0880016R	PF 0.1MF +-10% 50V	D201	2338321M	DI 1SS270
⚠ C781	0262426F	PP 9100PF +-5% 1.8KV	D202	2338321M	DI 1SS270
⚠ C782	0244717	CD 270PF +-10% 2KV	D205	2338321M	DI 1SS270
⚠ C784	0262801F	PP 0.56MF +-5% 250V	D206	2338321M	DI 1SS270
C786	0243512R	CD 820PF +-10% 500V	D601	CH00681M	DI 11ES2
C787	0800012R	EL 4.7MF 50V	D612	2338321M	DI 1SS270
C789	0890077R	CD 180PF +-10% 50V	D710	2338321M	DI 1SS270
C790	0244501R	CD 1000PF +-10% 500V	D739	2338321M	DI 1SS270
C795	0880005R	PF 2200PF +-10% 50V	D751	CH00712M	DI 10ELS4
C801	0890083R	CD 470PF +-10% 50V	D752	CH00712M	DI 10ELS4
C802	0890082R	CD 390PF +-10% 50V	D753	CH00711M	DI 10ELS2
C803	0890084R	CD 560PF +-10% 50V	D753A	2338321M	DI 1SS270
C805	0245612F	CD 4700PF +-10% 1KV	D757	2338321M	DI 1SS270
C810	0800359R	EL 1000MF 10V	D758	2338321M	DI 1SS270

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SYMBOL NO.	PART NO.	DESCRIPTION	SYMBOL NO.	PART NO.	DESCRIPTION
D760	2338321M	DI 1SS270	FB954	2123462M	FERRITE BEADS CORE B 2.3UH
D802	2338321M	DI 1SS270	IC1101	CP03562	IC M37210M4-6575P
D804	2338321M	DI 1SS270	IC1102	CP03461	IC AT24AC04
D810	2338321M	DI 1SS270	IC201	2004415	IC TDA8362/N5
D811	2338321M	DI 1SS270	IC4501	2004022	IC AN7147N
D812	2338321M	DI 1SS270	IC451	2020601	IC MM1053XS
D901	2342711M	DI EM2A	IC501	CP02611	IC TDA4665
D902	2342711M	DI EM2A	IC502	2004431	IC TDA8395
D903	2342711M	DI EM2A	IC681	2020631	IC AN5515
D904	2342711M	DI EM2A	⚠ IC901	2917782/3	IC CNX82A
D905	2338321M	DI 1SS270	L101	2122253M	LA AXIAL COIL 100MH
D906	CH00711M	DI 10ELS2	L1101	2123739R	RADIAL COIL (1MH)
D907	2337341M	DI 1SS270A	L1102	2123298M	LA AXIAL COIL 22MH +-10%
D908	2343961M	DI MPG06D	L1103	2122956M	AXIAL COIL 100MH
D909	2343961M	DI MPG06D	L201	2123103M	LA AXIAL COIL 10MH
D910	2338321M	DI 1SS270	L202	2146114	HIGH FREQ. COIL 38.9MHZ
D951	2333001M	DI RU2M	L203	2123411M	AXIAL COIL 1MH-K
D952	2333001M	DI RU2M	L204	2123411M	AXIAL COIL 1MH-K
DR1166	2338321M	DI 1SS270	L501	2123102M	LA AXIAL COIL 8.2MH-K
E001	3737101	PURSE LOCK 15	L502	2123104M	AXIAL COIL 12MH
E002	3737101	PURSE LOCK 15	L507	2123103M	AXIAL COIL 10MH
E003	3731081	PURSE LOCK 10	L768	2122253M	LA AXIAL COIL 100 MH
E050	3705233	ANODE CLAMPER	L781	2164541B	LINEARITY COIL
E061	4615641A	WEDGE	L802	BH00205R	FILTER COIL 22 MH
E0701	2788084	CPT EARTH WIRE	⚠ L901	2272392	LINE FILTER
E203	2774731R	FERRITE BEADS CORE WITH LEAD	L902	BV00175	LINE FILTER 220MH
E301	2982956	4P JACK	⚠ L905	2276001B	DEGAUSSING COIL
E402	2902261	2P MINI PLUG PIN WITH BASE	L951	2123781R	PEAKING COIL 100MH-K
E403	2902262	3P MINI PLUG PIN WITH BASE	L952	2123781R	PEAKING COIL 100MH-K
E601	2611361	ROTARY SWITCH	L953	2123781R	PEAKING COIL 100MH-K
E701	2776242A	CF MAGNET	L954	2123781R	PEAKING COIL 100MH-K
⚠ E801	2698352B	CRT SOCKET	MF401	2167311B	CERAMIC FILTER 4.5MHZ
E802	2903542	2P PLUG WITH BASE	MF402	2167211B	CERAMIC FILTER 5.5MHZ
E805	2995604	8P CONNECTOR	MF403	2167212B	CERAMIC FILTER 6.0MHZ
E900	2783981	LEAD PIN L	MF404	2767213B	CERAMIC FILTER 6.5MHZ
⚠ E903	2972582	POWER SUPPLY CORD (193/194)	MF501	BN00171	CERAMIC TRAP 5.5/5.74MHZ
⚠ E903	2972592	POWER SUPPLY CORD (194S/982)	MF502	BN00172	CERAMIC TRAP 6.0/6.5MHZ
E904	2661753	4P PLUG PIN WITH BASE	MF503	2123451	CERAMIC TRAP 4.5MHZ
E906L	2729252R	FUSE HOLDER	PR952	AZ00104M	2A PROTECTOR
E906R	2729252R	FUSE HOLDER	Q101	2326875R	TR DTC144WS
E907	2995909	2J PROCESSED WIRE WITH AMPIN	Q102	2326875R	TR DTC144WS
E950	3763751	SK BINDER	Q1101	CF01421	TR KTC3198GR
EM	2665272A	4P PLUG PIN WITH BASE (UL)	Q1102	CF01421R	TR KTC3198GR
⚠ F901	2721615	FUSE 3.15A	Q1104	CF01421R	TR KTC3198GR
FB1101	2771892	FERRITE BEADS CORE (004)	Q1105	CP02871R	IC KIA70429
FB781	2122653M	FERRITE BEADS CORE WITH LEAD	Q1106	CF01421R	TR KTC3198GR
FB901	2123468M	FERRITE BEADS CORE LEAD 0.8	Q201	CF01011R	TR KTC3197
FB902	2123468M	FERRITE BEADS CORE LEAD 0.8	Q203	2326875R	TR DTC144WS
FB903	2123468M	FERRITE BEADS CORE LEAD 0.8	Q204	2326875R	TR DTC144WS
FB951	2123462M	FERRITE BEADS CORE B 2.3UH	Q205	2326875R	TR DTC144WS
FB952	2123462M	FERRITE BEADS CORE B 2.3UH	Q301	CF01431R	TR KTA1266Y
FB953	2123462M	FERRITE BEADS CORE B 2.3UH	Q303	2326875R	TR DTC144WS

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Q401	CF01421R	TR KTC3198GR	R1126	0700053M	CF 8.2K OHM +-5% 1/16W
Q402	CF01421R	TR KTC3198GR	R1127	0700053M	CF 8.2K OHM +-5% 1/16W
Q4501	2326873R	TR DTC144ES	R1128	0700055M	CF 12K OHM +-5% 1/16W
Q4503	CF01421R	TR KTC3198GR	R1129	0700054M	CF 10K OHM +-5% 1/16W
Q4504	CF01421R	TR KTC3198GR	R1130	0700054M	CF 10K OHM +-5% 1/16W
Q501	CF01421R	TR KTC3198GR	R1132	0700046M	CF 2.7K OHM +-5% 1/16W
Q502	CF01421R	TR KTC3198GR	R1133	0700053M	CF 8.2K OHM +-5% 1/16W
Q506	CF01421R	TR KTC3198GR	R1134	0700039M	CF 820 OHM +-5% 1/16W
Q507	CF01431R	TR KTA1266Y	R1135	0700054M	CF 10K OHM +-5% 1/16W
Q721	CF01061R	TR MPSA42	R1136	0700054M	CF 10K OHM +-5% 1/16W
Q723	CF01041R	TRS KTC3205	R1137	0700045M	CF 2.2K OHM +-5% 1/16W
Q724	CF01431R	TR KTA1266Y	R1138	0700054M	CF 10K OHM +-5% 1/16W
Q781	2315161	TR BU2508DF	R1139	0700056M	CF 15K OHM +-5% 1/16W
Q801	CF01431R	TR KTA1266Y	R1139A	0700037M	CF 560 OHM +-5% 1/16W
Q851	CF00951	TR KTC3229	R1140	0700054M	CF 10K OHM +-5% 1/16W
Q852	CF00951	TR KTC3229	R1141	0700055M	CF 12K OHM +-5% 1/16W
Q853	CF00951	TR KTC3229	R1142	0700052M	CF 6.8K OHM +-5% 1/16W
Q901	CF01431R	TR KTA1266Y	R1143	0700055M	CF 12K OHM +-5% 1/16W
Q902	2312971R	TR BC368	R1144	0700052M	CF 6.8K OHM +-5% 1/16W
Q903	2314792	TR ON4959	R1145	0700052M	CF 6.8K OHM +-5% 1/16W
Q904	CF01421R	TR KTC3198GR	R1146	0700051M	CF 5.6K OHM +-5% 1/16W
Q905	CF01451	TR KTC4369	R1147	0700027M	CF 100 OHM +-5% 1/16W
Q951	CF01051R	TR KTC3200 GR	R1148	0700027M	CF 100 OHM +-5% 1/16W
Q952	CF01421R	TR KTC3198 GR	R1149	0700041M	CF 1K OHM +-5% 1/16W
Q953	CF01431R	TR KTA1266Y	R1150	0700041M	CF 1K OHM +-5% 1/16W
Q954	CF01421R	TR KTC3198 GR	R1151	0700054M	CF 10K OHM +-5% 1/16W
Q955	CJ00161R	TR BT149-B	R1154	0700061M	CF 33K OHM +-5% 1/16W
Q956	CF01421R	TR KTC3198 GR	R1155	0700058M	CF 22K OHM +-5% 1/16W
Q957	CF01231	TR BD330	R1156	0700058M	CF 22K OHM +-5% 1/16W
Q958	CF01421R	TR KTC3198 GR	R1157	0700027M	CF 100 OHM +-5% 1/16W
R1001	0700041M	CF 1K OHM +-5% 1/16W	R1158	0700027M	CF 100 OHM +-5% 1/16W
R101	0700058M	CF 22K OHM +-5% 1/16W	R1159	0700027M	CF 100 OHM +-5% 1/16W
R102	0700054M	CF 10K OHM +-5% 1/16W	R1160	0700041M	CF 1K OHM +-5% 1/16W
R103	0700054M	CF 10K OHM +-5% 1/16W	R1161	0700041M	CF 1K OHM +-5% 1/16W
R1101	0110223S	MF 120 OHM +-5% 2W	R1162	0700056M	CF 15K OHM +-5% 1/16W
R1102	0700051M	CF 5.6K OHM +-5% 1/16W	R1163	0700056M	CF 15K OHM +-5% 1/16W
R1103	0700027M	CF 100 OHM +-5% 1/16W	R1165	0700056M	CF 15K OHM +-5% 1/16W
R1104	0700027M	CF 100 OHM +-5% 1/16W	R1166	0700051M	CF 5.6K OHM +-5% 1/16W
R1106	0700041M	CF 1K OHM +-5% 1/16W	R1167	0700054M	CF 10K OHM +-5% 1/16W
R1107	0700043M	CF 1.5K OHM +-5% 1/16W	R1168	0700054M	CF 10K OHM +-5% 1/16W
R1108	0700058M	CF 22K OHM +-5% 1/16W	R1169	0700062M	CF 39K OHM +-5% 1/16W
R1109	0700058M	CF 22K OHM +-5% 1/16W	R1170	0700062M	CF 39K OHM +-5% 1/16W
R1110	0700058M	CF 22K OHM +-5% 1/16W	R1171	0700056M	CF 15K OHM +-5% 1/16W
R1111	0700027M	CF 100 OHM +-5% 1/16W	R1172	0700054M	CF 10K OHM +-5% 1/16W
R1112	0700027M	CF 100 OHM +-5% 1/16W	R1176	0700054M	CF 10K OHM +-5% 1/16W
R1113	0700027M	CF 100 OHM +-5% 1/16W	R1177	0700058M	CF 22K OHM +-5% 1/16W
R1118	0700067M	CF 100K OHM +-5% 1/16W	R1180	0700041M	CF 1K OHM +-5% 1/16W
R1119	0700038M	CF 680 OHM +-5% 1/16W	⚠ R1181	0100123M	CF 270K OHM +-5% 1/8W
R1120	0700035M	CF 390 OHM +-5% 1/16W	R1182	0700054M	CF 10K OHM +-5% 1/16W
R1121	0700035M	CF 390 OHM +-5% 1/16W	R1183	0700066M	CF 82K OHM +-5% 1/16W
R1123	0700041M	CF 1K OHM +-5% 1/16W	R1184	0700054M	CF 10K OHM +-5% 1/16W
R1125	0700053M	CF 8.2K OHM +-5% 1/16W	R1185	0700058M	CF 22K OHM +-5% 1/16W

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SYMBOL NO.	PART NO.	DESCRIPTION	SYMBOL NO.	PART NO.	DESCRIPTION
R1190	0700042M	CF 1.2K OHM +-5% 1/16W	R4505	0700041M	CF 1K OHM +-5% 1/16W
R1191	0700042M	CF 1.2K OHM +-5% 1/16W	R4506	0700033M	CF 270 OHM +-5% 1/16W
R1192	0700042M	CF 1.2K OHM +-5% 1/16W	R4507	0700033M	CF 270 OHM +-5% 1/16W
R1193	0700037M	CF 560 OHM +-5% 1/16W	R4508	0700041M	CF 1K OHM +-5% 1/16W
R1194	0700052M	CF 6.8K OHM +-5% 1/16W	R4509	0700027M	CF 100 OHM +-5% 1/16W
R1195	0700051M	CF 5.6K OHM +-5% 1/16W	R451	0700047M	CF 3.3K OHM +-5% 1/16W
R1200	0700057M	CF 18K OHM +-5% 1/16W	R451A	0100035M	CF 56 OHM +-5% 1/8W
R1202	0700041M	CF 1K OHM +-5% 1/16W	R470	0147130AF	WW 3.3K OHM 3W
R1203	0700038M	CF 680 OHM +-5% 1/16W	R502	0700031M	CF 180 OHM +-5% 1/16W
R1206	0700062M	CF 39K OHM +-5% 1/16W	R503	0700033M	CF 270 OHM +-5% 1/16W
R201	0700052M	CF 6.8K OHM +-5% 1/16W	R504	0700045M	CF 2.2K OHM +-5% 1/16W
R202	0700042M	CF 1.2K OHM +-5% 1/16W	R505	0100057M	CF 470 OHM +-5% 1/8W
R203	0100047M	CF 180 OHM +-5% 1/8W	R506	0700045M	CF 2.2K OHM +-5% 1/16W
R204	0700019M	CF 27 OHM +-5% 1/16W	R507	0700034M	CF 330 OHM +-5% 1/16W
R207	0700054M	CF 10K OHM +-5% 1/16W	R508	0700052M	CF 6.8K OHM +-5% 1/16W
R208	0700027M	CF 100 OHM +-5% 1/16W	R509	0700067M	CF 100K OHM +-5% 1/16W
R210	0700058M	CF 22K OHM +-5% 1/16W	R511	0700037M	CF 560 OHM +-5% 1/16W
R214	0700058M	CF 22K OHM +-5% 1/16W	R513	0700037M	CF 560 OHM +-5% 1/16W
R215	0700026M	CF 82 OHM +-5% 1/16W	R515	0700037M	CF 560 OHM +-5% 1/16W
R221	0700045M	CF 2.2K OHM +-5% 1/16W	R519	0100057M	CF 470 OHM +-5% 1/8W
R230	0700041M	CF 1K OHM +-5% 1/16W	R529	0700027M	CF 100 OHM +-5% 1/16W
R231	0700041M	CF 1K OHM +-5% 1/16W	R530	0700029M	CF 150 OHM +-5% 1/16W
R232	0700054M	CF 10K OHM +-5% 1/16W	R531	0700032M	CF 220 OHM +-5% 1/16W
R234	0700054M	CF 10K OHM +-5% 1/16W	R532	0700031M	CF 180 OHM +-5% 1/16W
R240	0119687G	FR 4.7 OHM +-5% 1/4W	R534	0700032M	CF 220 OHM +-5% 1/16W
R250	0100049M	CF 220 OMH +-5% 1/8W	R535	0700032M	CF 220 OHM +-5% 1/16W
R260	0700041M	CF 1K OMH +-5% 1/16W	R536	0700051M	CF 5.6K OHM +-5% 1/16W
R301	0700027M	CF 100 OHM +-5% 1/16W	R537	0700032M	CF 220 OHM +-5% 1/16W
R302	0100038M	CF 75 OHM +-5% 1/8W	R538	0700064M	CF 56K OHM +-5% 1/16W
R303	0700027M	CF 100 OMH +-5% 1/16W	R539	0700032M	CF 220 OHM +-5% 1/16W
R304	0700067M	CF 100K OHM +-5% 1/16W	R540	0700063M	CF 47K OHM +-5% 1/16W
R305	0700058M	CF 22K OHM +-5% 1/16W	R541	0700059M	CF 27K OHM +-5% 1/16W
R306	0700067M	CF 100K OHM +-5% 1/16W	R570	0700027M	CF 100 OHM +-5% 1/16W
R307	0700027M	CF 100 OHM +-5% 1/16W	R571	0100053M	CF 330 OHM +-5% 1/8W
R308	0700025M	CF 68 OHM +-5% 1/16W	R590	0119508S	FR 56 OHM +-5% 1/4W
R309	0100045M	CF 150 OHM +-5% 1/8W	R602	0100133M	CF 680K OHM +-5% 1/8W
R310	0700027M	CF 100 OHM +-5% 1/16W	R604	0700051M	CF 5.6K OHM +-5% 1/16W
R320	0700067M	CF 100K OHM +-5% 1/16W	R605	0700054M	CF 10K OHM +-5% 1/16W
R321	0700034M	CF 330 OHM +-5% 1/16W	R606	0700055M	CF 12K OHM +-5% 1/16W
R332	0700057M	CF 18K OHM +-5% 1/16W	R607	0700029M	CF 150 OHM +-5% 1/16W
R340	0100093M	CF 15K OHM +-5% 1/8W	R608	0700049M	CF 4.7K OHM +-5% 1/16W
R401	0700035M	CF 390 OHM +-5% 1/16W	R609	0119844M	MF 2.2 OHM +-5% 1W
R404	0100001M	CF 2.2 OHM +-5% 1/8W	R612	0113748M	CF 820 OHM +-5% 1/2W
R405	0100001M	CF 2.2 OHM +-5% 1/8W	R613	0700048M	CF 3.9K OHM +-5% 1/16W
R410	0700032M	CF 220 OHM +-5% 1/16W	R620	0700067M	CF 100K OHM +-5% 1/16W
R411	0700032M	CF 220 OHM +-5% 1/16W	R681	0113735M	CF 270 OHM +-5% 1/2W
R413	0700051M	CF 5.6K OHM +-5% 1/16W	R701	0700061M	CF 33K OHM +-5% 1/16W
R419	0700054M	CF 10K OHM +-5% 1/16W	R703	0700034M	CF 330 OHM +-5% 1/16W
R427	0700041M	CF 1K OHM +-5% 1/16W	R705	0700061M	CF 33K OHM +-5% 1/16W
R430	0700043M	CF 1.5K OHM +-5% 1/16W	R706	0700059M	CF 27K OHM +-5% 1/16W
R4503	0700067M	CF 100K OHM +-5% 1/16W	R707	0700045M	CF 2.2K OHM +-5% 1/16W
R4504	0700059M	CF 27K OHM +-5% 1/16W	R710	0100119M	CF 180K OHM +-5% 1/8W

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R711	0100123M	CF 270K OHM +-5% 1/8W	R908	0100075M	CF 2.7K OHM +-5% 1/8W
R712	0700069M	CF 150K OHM +-5% 1/16W	R909	0700059M	CF 27K OHM +-5% 1/16W
R712A	0700076M	CF 470K OHM +-5% 1/16W	R910	0700041M	CF 1K OHM +-5% 1/16W
R720	0110359S	MF 3.9K OHM +-5% 3W	R911	0700021M	CF 33 OHM +-5% 1/16W
R723	0100049M	CF 220 OHM +-5% 1/8W	R912	0114131M	CF 100 OHM +-5% 1/4W
R724	0700041M	CF 1K OHM +-5% 1/16W	R913	0700032M	CF 220 OHM +-5% 1/16W
R725	0700054M	CF 10K OHM +-5% 1/16W	R914	0114013M	CF 6.8 OHM +-5% 1/4W
⚠ R726	0700063M	CF 47K OHM +-5% 1/16W	R915	0114161	CF 1K OHM +-5% 1/4W
R727	0700054M	CF 10K OHM +-5% 1/16W	R916	0114169M	CF 2.2K OHM +-5% 1/4W
R730	0700047M	CF 3.3K OHM +-5% 1/16W	R917	0100041M	CF 100 OHM +-5% 1/8W
R733	0100051M	CF 270 OHM +-5% 1/8W	R918	0113791M	CF 47K OHM +-5% 1/2W
⚠ R751	0114223M	CF 82K OHM +-5% 1/4W	R919	0110221	MF 100 OHM +-5% 2W
⚠ R752	0114223M	CF 82K OHM +-5% 1/4W	R920	0110137	MF 470 OHM +-5% 1W
⚠ R757	0118970M	MF 240K OHM +-5% 1/4W	R921	0110145	MF 1K OHM +-5% 1W
⚠ R758	0119647M	MF 47K OHM +-1% 1/8W	R940	0110217S	MF 68 OHM +-5% 2W
R759	0110279S	MF 27K OHM +-5% 2W	R951	0700032M	CF 220 OHM +-5% 1/16W
R760	0700041M	CF 1K OHM +-5% 1/16W	R952	0700041M	CF 1K OHM +-5% 1/16W
R761	0700041M	CF 1K OHM +-5% 1/16W	R953	0700045M	CF 2.2K OHM +-5% 1/16W
R762	0100073M	CF 2.2K OHM +-5% 1/8W	R954	0100065M	CF 1K OHM +-5% 1/8W
R764	0119505S	FR 2.2 OHM +-5% 1/4W	R955	0700039M	CF 820 OHM +-5% 1/16W
R768	0100077M	CF 3.3K OHM +-5% 1/8W	R956	0700029M	CF 150 OHM +-5% 1/16W
⚠ R781	0147626A	WW 4.7K OHM +-10% 7W	R957	0113754M	CF 1.5K OHM +-5% 1/2W
R782	0113748M	CF 820 OHM +-5% 1/2W	R958	0700049M	CF 4.7K OHM +-5% 1/16W
R801	0700027M	CF 100 OHM +-5% 1/16W	R959	0700049M	CF 4.7K OHM +-5% 1/16W
R802	0700027M	CF 100 OHM +-5% 1/16W	R960	0700049M	CF 4.7K OHM +-5% 1/16W
R803	0700027M	CF 100 OHM +-5% 1/16W	R961	0700049M	CF 4.7K OHM +-5% 1/16W
R804	0700033M	CF 270 OHM +-5% 1/16W	R962	0113791M	CF 47K OHM +-5% 1/2W
R805	0700035M	CF 390 OHM +-5% 1/16W	R964	0100078M	CF 3.6K OHM +-5% 1/8W
R806	0700033M	CF 270 OHM +-5% 1/16W	R965	0700046M	CF 2.7K OHM +-5% 1/16W
R807	0700044M	CF 1.8K OHM +-5% 1/16W	R966	0113789M	CF 39K OHM +-5% 1/2W
R808	0700044M	CF 1.8K OHM +-5% 1/16W	R967	0110155S	MF 2.7 OHM +-5% 1W
R809	0700044M	CF 1.8K OHM +-5% 1/16W	R968	0110135S	MF 390 OHM +-5% 1W
R811	0110271S	MF 12K OHM +-5% 2W	R969	0700054M	CF 10K OHM +-5% 1/16W
R812	0110271S	MF 12K OHM +-5% 2W	R970	0700049M	CF 4.7K OHM +-5% 1/16w
R813	0110271S	MF 12K OHM +-5% 2W	R971	0700034M	CF 330 OHM +-5% 1/16W
R814	0113744M	CF 560 OHM +-5% 1/2W	⚠ R998	0174704	MF 10M OHM +-5% 1W
R815	0113744M	CF 560 OHM +-5% 1/2W	RK002	0700032M	CF 220 OHM +-5% 1/16W
R816	0113744M	CF 560 OHM +-5% 1/2W	S1101	2632851A	5 KEY TACT SWITCH
R817	0700037M	CF 560 OHM +-5% 1/16W	⚠ S901	2634731	PUSH SWITCH
R818	0700037M	CF 560 OHM +-5% 1/16W	SP401	GK00061	SPEAKER 5x9
R819	0700037M	CF 560 OHM +-5% 1/16W	SP402	GK00061	SPEAKER 5x9
R820	0700045M	CF 2.2K OHM +-5% 1/16W	T721	2260221	HORIZONTAL DRIVE TRANSFORMER
R821	0700054M	CF 10K OHM +-5% 1/16W	⚠ T761	BW00302	FLYBACK TRANSFORMER
R822	0700054M	CF 10K OHM +-5% 1/16W	⚠ T901	BT00551	SWITCHING TRANSFORMER
R823	0700054M	CF 10K OHM +-5% 1/16W	TH901	CJ00131	PTC THERMISTOR
R850	0100041M	CF 100 OHM +-5% 1/8W	U001	HJ00221	TUNER TUHIF 4EG-751
R901	0147614AX	WW 1.5K OHM +-10% 7W	U1101	2574103	R/C TRANS. CLE-898A
R901A	0147616A	WW 1.8K OHM +-10% 7W	⚠ U701	BY00682	DY
R902	0113787M	CF 33K OHM +-5% 1/2W	⚠ V1	2471272	CRT A51KPD12XX
R903	0100085M	CF 6.8K OHM +-5% 1/8W	VR202	0150265	VR 10K OHM
R906	0114165M	CF 1.5K OHM +-5% 1/4W	VR601	0150270	VR 500 OHM
R907	0110223	CF 120 OHM +-5% 2W	VR701	0150114	VR 10K OHM-B

PRODUCT SAFETY NOTE: Components marked with a ⚠ have special characteristics important to safety
Before replacing any of these components, read carefully the PRODUCT SAFETY NOTICE of this Service Manual.
Don't degrade the safety of the receiver through improper servicing.

SYMBOL NO.	PART NO.	DESCRIPTION	SYMBOL NO.	PART NO.	DESCRIPTION
VR801	0150110	VR 500 OHM-B		8781450	3X20 TAPPING SCREW
VR802	0150110	VR 500 OHM-B		8781646B	4X16B TAPPING SCREW
VR803	0150110	VR 500 OHM-B		QD03131	FRAME ASS'Y
VR804	0150109	VR 200 OHM-B RV-6		QT00113	DHHS SERVICEMAN WARNING LABEL
VR806	0150109	VR 200 OHM-B RV-6			
VR951	0150152	VR 1K OHM-B			
X1101	2792071	CRYSTAL CST 4.00MGW			
X501	2791505A	CRYSTAL 3.58MHZ			
X503	2170043A	CRYSTAL 4.43			
ZD1001	2339819M	ZD HZS3C3			
ZD1101	2339837M	ZD HZS-5C1			
ZD1120	2339812M	ZD HZS3A2			
ZD201	2339889M	ZD HZS-12 (C3)			
ZD501	2331795M	ZD HZ-5 (B2)			
ZD503	2339869M	ZD HZS9C3			
ZD701	2331817M	ZD HZ7C1			
ZD721	2339843M	ZD HZS6A3			
⚠ ZD751	2339222M	ZD HZS27-2L			
ZD753	2339867M	ZD HZS9C1			
ZD754	2335991M	ZD HZT-33-02			
⚠ ZD755	2339812M	ZD HZS3A2			
ZD810	2331797M	ZD HZ5C1			
ZD810A	2331836M	ZD HZ11B3			
ZD901	2339819M	ZD HZS3C3			
ZD902	2339825M	ZD HZS4B2			
ZD903	2339889M	ZD HZS12C3			
ZD904	2339835M	ZD HZS5B2			
ZD905	2339842M	ZD HZS6A2			
ZD951	2339853M	ZD HZS7A3			
ZD952	2339893M	ZD HZS15-3			
ZD953	2339847M	ZD HZS6C1			
ZD954	2339869M	ZD HZS9C3			
	2772982K	FERRITE SHEET			
	2905241	ADAPTOR			
	2941311	BATTERY AA1015			
	2976143	CONNECTOR			
	2976755A	3J MINI CONNECTOR WITH WIRE			
	3164855	BACK COVER (194)			
	3164856	BACKCOVER (193/194S/982)			
	3332453	SPRING FOR KNOB			
	3333921	EARTH SPRING			
	3763751	SK BINDER			
	3870211A	DEGAUSSING COIL HOLDER			
	3876121	FBT SUPPORT			
	4159423B	3X12B TAPPING SCREW WITH WASHER			
	4243445	G51 INSULATION WASHER			
	4518375A	6X25 SCREW W/WASHER & RUBBER			
	4518742	M2.3X12 SCREW WITH WASHER			
	4518753	2.3 MUT			
	4519501	3X10 B-TIGHT TAPPING SCREW			
	4520883	M3X12 TAPPING SCREW			

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